Editor's note: Reconsideration denied by Order dated Nov. 20, 1998

ISLAND MOUNTAIN PROTECTORS,
NATIONAL WILDLIFE FEDERATION,
ASSINIBOINE AND GROS VENTRE TRIBES,
and FORT BELKNAP COMMUNITY COUNCIL

IBLA 97-76, 97-77, 97-85 Decided May 29, 1998

Appeal of decisions by the Phillips Resource Area Manager, Bureau of Land Management, approving expansion of the Zortman and Landusky Mines and modifications to their reclamation plans. MTM-77778, MTM-77779.

Appeals dismissed in part as moot, decisions vacated in part and remanded.

1. Administrative Appeals: Generally--Appeals: Generally--Rules of Practice: Appeals: Dismissal

   An appeal will be dismissed as moot if, as a result of events occurring after it is filed, the Board can give no effective relief. Appeals challenging the adequacy of an EIS to support decisions approving mine expansion plans and long-term reclamation practices to correct problems with acid rock drainage do not become moot as to the long-term reclamation practices when the mine expansion plans are cancelled.

2. Environmental Quality: Environmental Statements--Indians: Trust Responsibility--National Environmental Policy Act of 1969: Environmental Statements

   Actions by the Federal Government are subject to a general trust responsibility to Native Americans. A Federal agency's trust obligation to a Tribe extends to actions it takes off a reservation which uniquely impact tribal members or property on a reservation. Absent a specific provision of a treaty, agreement, executive order, or statute requiring BLM to give preference to a Tribe, BLM is not required to select a particular alternative when reviewing an EIS. Compliance with Federal laws and regulations designed to protect the environment, however, does not satisfy BLM's general trust responsibility.

3. Environmental Quality: Environmental Statements--National Environmental Policy Act of 1969: Environmental Statements

Incomplete information about the specific geologic features controlling the flow of groundwater at the mine sites was relevant to evaluating reasonably foreseeable significant adverse effects and essential to a reasoned choice among alternatives. BLM was obligated to obtain additional information or, if the means to obtain it were not known, make the disclosures required by 40 C.F.R. § 1502.22(b). Absent compliance with the regulation, BLM did not take a hard look at the environmental consequences of the proposed project.

4. Environmental Quality: Generally--Federal Land Policy and Management Act of 1976: Surface Management--Indians: Trust Responsibility--National Environmental Policy Act of 1969: Generally--Public Lands: Generally

The statutory mandate to prevent unnecessary or undue degradation of the public lands requires BLM to consider the nature and extent of surface disturbances resulting from a proposed operation and environmental impacts on resources and lands outside the area of operations, not including lands held in trust for the benefit of Indians. When BLM fails to meet its obligations under NEPA, it also fails to protect public lands from unnecessary or undue degradation.

APPEARANCES: Donald R. Marble, Esq., Chester, Montana, for the Island Mountain Protectors; Thomas M. France, Esq., Missoula, Montana, for the National Wildlife Federation; Michael Axline, Esq. and Marianne Dugan, Esq., Eugene, Oregon, for the Assiniboine and Gros Ventre Tribes and the Fort Belknap Community Council; Karan L. Dunnigan, Esq., Office of the Field Solicitor, U.S. Department of the Interior, Billings, Montana, for the Bureau of Land Management; Jim Butler, Esq., Lisa A. Kirschner, Esq., and Edward B. Grandy, Esq., Salt Lake City, Utah, for Zortman Mining, Inc.; Robert Edd Lee, Esq., Billings, Montana, for T.E.A.M.

OPINION BY ADMINISTRATIVE JUDGE IRWIN

The Island Mountain Protectors, the National Wildlife Federation (NWF), the Assiniboine Tribe, the Gros Ventre Tribe (the Tribes), and the Fort Belknap Community Council have appealed two October 25, 1996, Decisions by the Area Manager, Phillips Resource Area, Bureau of Land Management (BLM), to approve expansion of the Zortman and Landusky Mines in the Little Rocky Mountains, Phillips County, Montana, and modify their reclamation plans. The Area Manager, along with the Director of the Montana

Department of Environmental Quality (MDEQ), signed the October 25, 1996, record of decision (ROD) based upon a two-volume environmental impact statement (EIS) issued in March 1996.

The appeals were docketed as IBLA 97-76, IBLA 97-77, and IBLA 97-85 respectively. By Order dated December 19, 1996, the appeals were consolidated and Zortman Mining Incorporated (Zortman, ZMI) and T.E.A.M. (Together we Educate, Activate, and Motivate) were allowed to intervene. Statements of reasons (SOR) were filed by Island Mountain Protectors and jointly by the NWF, the Tribes, and the Fort Belknap Community Council. Zortman, BLM, and T.E.A.M. each filed consolidated answers. The NWF, the Tribes, and the Fort Belknap Community Council jointly filed a reply. A stay of BLM's Decision was granted on June 16, 1997. Responding to motions by Zortman and T.E.A.M., we granted expedited consideration by Order dated July 24, 1997.

On March 16, 1998, Zortman filed a motion requesting that the appeals be dismissed as moot. It explains that "[o]n January 16, 1998, Pegasus Gold Inc. and certain of its subsidiaries, including Zortman, filed voluntarily to reorganize under Chapter 11 of the Bankruptcy Code" and that "[o]n March 10, 1998, Pegasus and Zortman announced that, as a result of delays in the permitting process and the concurrent changes in economic circumstances, the companies had cancelled plans to construct the Zortman Extension Project and had decided to proceed with reclamation of the site." (ZMI Motion at 2.) Zortman asserts that the decision to cancel the project "eliminates any opportunity for the Board to grant appellants effective relief," there is "nothing more than a remote and theoretical possibility that the same controversies could be repeated involving the same complaining parties," and "[a]ny further modifications to the Zortman plan of operations will require NEPA [the National Environmental Policy Act of 1969, 42 U.S.C. § 4332 (1994)] compliance and result in a BLM decision that will be subject to a new appeal." (ZMI Motion at 3.)

Noting the same facts as Zortman, BLM has requested that the appeals be remanded for further action. BLM explains that it anticipates "that a final reclamation plan will be submitted by ZMI in the near future" and BLM "must have jurisdiction to address the extension project cancellation or consider and analyze any final reclamation plan." (BLM Motion at 2 (footnote omitted).) BLM also states that its "decision and analysis on the final reclamation plan will be appealable to the Board" and, consequently, "the issues before the Board will not evade review." Id. Zortman has filed a statement agreeing that "BLM needs jurisdiction over the plans of operations for the Zortman and Landusky mines so that it can consider revisions to those plans that will be submitted by Zortman as a result of cancellation of the plans for mine expansion."

The NWF, the Tribes, and the Fort Belknap Community Council oppose Zortman's motion to dismiss their appeals. They contend that the decision not to expand the mines does not render their arguments moot because Zortman remains obligated to reclaim the mine sites and BLM's decision

"encompasses both expansion and reclamation activities." (NWF Response to Motion at 2.) They point out that BLM added requirements to Zortman's reclamation plan because, as acknowledged in the EIS, current plans were inadequate to limit acid rock drainage (ARD) and the ROD acknowledges that the EIS includes "the reclamation and remediation plans needed at both mines for control of ARD." Id., quoting ROD at 2. Appellants contend that the additional measures BLM imposed "were not adequate to fully address the problems, such as ARD," and that their appeal challenges "the adequacy of the measures that the BLM selected, including water balance covers, mine drainage remediation, and the pit reclamation plan." Id. at 2-3. They believe the appeals are not moot because the Board may "grant effective relief by ordering the BLM to develop suitable modifications to ZMI's reclamation plan and prepare an EIS for those modifications." Id. at 3.

Appellants also assert that "the issues in this case remain justiciable" because the ROD remains in effect and that, even if BLM withdraws the ROD, "this appeal would not be moot." Id. at 3. They note that the Order granting the stay found they had raised "serious, substantial, and difficult issues" and contend that Zortman, or a company purchasing the mining claims, may pursue the expansion in the future. Id. at 3-4. They argue that the Board should address the merits of the appeal to provide BLM guidance in likely future cases and that, "without review at this stage, the BLM will continue to misinterpret its trust responsibilities to the Tribes and its duties under NEPA." Id. at 4.

To address the motions and the Appellants' response it is necessary to set out some of the history of operations at the mines and their current status. Several circumstances established the scope of the EIS and matters addressed in the ROD. They, in turn, affect a number of the issues Appellants raise and the question whether the appeals have become moot or whether there remains a justiciable controversy.

History and Background

Zortman, a subsidiary of Pegasus, began mining operations in 1979 after the Montana Department of State Lands (DSL, subsequently MDEQ) prepared a draft EIS and, after receiving comments, adopted the draft as final and issued state permits 00095 (Landusky) and 00096 (Zortman). 1/ (EIS at 1-1 and 1-2.) BLM later approved plans of operations for the mines (MTM-77778, Zortman; MTM-77779, Landusky). Subsequently, BLM and DSL/MDEQ approved 11 amendments to the Zortman permit and plan of operations, and

1/ The 1979 EIS is identified as appendix 18 in volume 7 of the "Zortman Mine Life Extension Project," but the document is not in the binder. A copy was included in the record previously submitted to the Board. See Red Thunder, Inc., 129 IBLA 219, 235 n.5, 101 I.D. 52, 61 n.5 (1994).

the Landusky permit and plan was amended 10 times. 2/ (EIS at 1-7 and 1-8, tbl. 1-1 and 1-2).

Zortman filed the "Zortman Mine Life Extension Project" plan of operations (Zortman POP) that, as modified, is at issue in the present appeal on May 11, 1992. BLM announced that it would prepare an EIS to review Zortman's "proposal to expand the processing of oxide and nonoxide ore reserves." 57 Fed. Reg. 56588 (Nov. 30, 1992). Before BLM determined that Zortman's application was complete, the Director of the Montana State Office, BLM, ordered changes in operations at the Landusky Mine and required Zortman and Pegasus to submit significant modifications to the plans of operations for both mines because effluent containing elevated metals and sulfates, low pH readings, and other indications of ARD had been found in mine drainages. (Decisions of Apr. 13, 1993.)

The State Director's decisions were appealed to the Board by Red Thunder, Inc., which argued that he should have ordered the mines shut down in order to prevent unnecessary or undue degradation, the standard established by 43 U.S.C. § 1732(b) (1994), and allow time to review remedial measures for ARD under NEPA. Red Thunder, Inc., 129 IBLA 219, 234-35, 101 I.D. 52, 61 (1994). Although the Board agreed that the State Director had authority to order a cessation of operations, it found that Departmental regulations also authorized him to identify and impose reasonable measures "needed to reduce the degradation so that it is no longer unnecessary or undue." Id. at 237, 101 I.D. at 62-63. In regard to NEPA, the Board concluded that measures the State Director had ordered which were designed to have immediate effect in abating ARD were exempt from review under Flint Ridge Development Co. v. Scenic Rivers Association, 426 U.S. 776, 788, 791, reh'g denied 429 U.S. 875 (1976), because

> the time required to prepare an EA, and perhaps an EIS, to review remedial measures prior to ordering ZMI to undertake them would be fundamentally at odds with the need for action to abate damage to the environment and would thus be inconsistent with the Secretary's duty to prevent unnecessary or undue degradation[.] * * * Measures not designed to have immediate effect are not within the exception and may be implemented only after BLM has conducted the environmental review mandated by NEPA.

Red Thunder, Inc., supra, at 240-41, 101 I.D. at 64-65. The significant modifications to the plans of operations the State Director had required Zortman to provide were not before the Board and remained subject to NEPA review. Id. at 240, 101 I.D. at 64.

2/ Amendments to the plan of operations for the Landusky Mine were at issue in Red Thunder, Inc., 117 IBLA 167, 97 I.D. 263 (1990), and Red Thunder, Inc., 124 IBLA 267 (1992).

Zortman's proposed modifications to the plan of operations for the Landusky Mine, and a BLM modified alternative, were addressed in a "Supplemental Environmental Assessment for State Operating Permit 00095 and Federal Plan of Operations MTM-77779, Landusky Mine Operating and Reclamation Plan Modifications Acid Rock Drainage Control and Remediation" (November 1993). (MTM-77779, Vol. 28.) Some measures were approved by a Decision Record (DR) signed by the BLM District Manager on February 25, 1994. (MTM- 77779, Vol. 30.) The DR, however, withheld "approval of final, long-term, reclamation and closure designs for ARD prevention, control and treatment at the Landusky Mine until the designs have undergone additional environmental analysis in an environmental impact statement." Id. at 1.

In February 1994, Zortman provided BLM with "Alternative Reclamation Plans for the Zortman Mining Area" (January 1994), identifying "anticipated changes in reclamation plans which would be implemented to ensure that water quality management objectives were met." (MTM-77778, Vol. 19, at 3.) Also in February 1994, Zortman filed further "Revisions to Plans for the Landusky Mining Area," including proposals to mine an additional 6 million tons of ore and 10 million tons of waste rock, construct a leach pad, and revise the reclamation plan. (MTM-77779, Vol. 31.) The final version, dated March 10, 1995 (Landusky POP), was subject to review in the EIS, the ROD, and BLM's October 25, 1996, Decision on the Landusky Mine.

The development of ARD at the mines led the MDEQ to file suit in state court in 1993 alleging violations of the Montana Water Quality Act in seven drainages. Based upon the alleged violations, BLM issued notices of noncompliance, which Zortman appealed to the Board (IBLA 94-260). In July 1993, the U.S. Environmental Protection Agency (EPA) issued Zortman a notice of violation for unauthorized discharges of pollutants into surface waters, and in 1995 it filed suit in U.S. District Court for the District of Montana alleging various violations of the Clean Water Act, 33 U.S.C. §§ 1251-1387 (1994). (MTM-77778, Vol. 27; MTM-77779, Vol. 27.) The State of Montana filed a supplemental complaint and the Tribes, the Fort Belknap Community Council, and the Island Mountain Protectors jointly filed a separate suit. Id. The litigation was resolved by a Consent Decree (CD) entered on September 27, 1996. See 61 Fed. Reg. 41182 (Aug. 7, 1996). Based upon the CD, the Board set aside and remanded the State Director's decision affirming issuance of notices of noncompliance. (IBLA 94-260, Order of Oct. 3, 1996.)

Shortly before the Board issued its decision on Red Thunder's appeal of the decisions ordering Zortman to implement changes in operations and submit significant modifications to the plans of operations, BLM announced that it would expand the scope of the EIS to "include long-term mining and reclamation practices for the Landusky Mine to correct existing problems identified with acid rock drainage" and that the expanded EIS would "provide a comprehensive impacts analysis for deciding on future mine expansion and reclamation requirements at both operations." 59 Fed. Reg. 16656 (Apr. 7, 1994).

BLM released a draft EIS addressing the "Zortman and Landusky Mines Reclamation Plan Modifications and Mine Life Extensions" in early August 1995 and the final EIS in mid-March 1996. The final EIS reviews seven alternatives. The first three contemplate that the mines would not be expanded but that reclamation would occur under different scenarios. The first, the "no action" alternative, is described as examining current conditions at the mines and "future conditions which would result from the agencies not approving additional mining and not modifying the existing reclamation plans." (EIS at 2-30.) The alternative, however, incorporates measures adopted to respond to ARD. They include a program to sample, test, characterize, and dispose of waste rock based upon its sulfur content; the use of drainage ditches to divert surface water from entering mine pits, leach pads, and waste dumps; the use of sumps and capture ponds to collect water impacted by contact with acid generating materials; and a water treatment plant constructed at the Zortman Mine in May 1994. Id. at 2-33, 2-36, 2-51 to 2-56.

The EIS describes Alternative 2 as "ZMI's modifications to the currently approved reclamation procedures at the two mines," while Alternative 3 adds "agency modifications to the currently approved reclamation procedures at the two mines." Id. at 2-83, 2-89. The latter, however, are described in relation to Zortman's proposed reclamation plans. Id. at 2-92. They include improved drainage ditches and diversion channels, the use of "water balance" and "water barrier" reclamation covers, more restrictive standards for classifying waste material as "non-acid generating," and reduced reclamation slopes. Id. at 2-92 to 2-97. In addition, sulfide material from the Alder Gulch and OK rock dumps, the Zortman 85/86 leach pad and dike, Ruby Gulch and other facilities would be used as backfill in the mine pits. Id. at 2-93, 2-97 to 2-98. The alternative also identifies a number of new water monitoring wells and sites. Id. at 2-102.

Alternative 4 consists of Zortman's proposed mine expansion plans and the company's "proposed revisions to the reclamation plans at each mine." (EIS at 2-104.) Briefly stated, Zortman proposed to deepen and expand the six existing pits at the Zortman Mine to form a single pit by removing 80 million tons of oxide and nonoxide ores along with 60 million tons of waste rock. (Zortman POP, Vol. 1, at 2-26; EIS at 1-9, 2-104.) The ore was to be crushed and transported on a 12,000-foot covered conveyor line to a 200-acre heap leach pad to be constructed, along with a processing plant and solution ponds, on Goslin Flats, south of the town of Zortman. (Zortman POP, Vol. 1, at 2-43; EIS at 1-9.) Waste rock would be put into a new 162-acre repository constructed in Carter Gulch. (EIS at 2-129.) Operations were to be conducted 24 hours a day, 7 days a week, 350 days per year, for 5 to 8 years. Id. at 1-9, 2-109. The total disturbed area would have increased from 405 acres to 1,292 acres. (Zortman POP, Vol. 1, at 2-5; EIS at 2-104.) In addition, 7.6 million tons of ore and 7 million tons of waste rock were to have been mined at Landusky, extending the life of that mine for less than a year. (EIS at 1-10.) Reclamation measures included the use of diversion ditches, water capture and treatment systems

at each mine, backfilling mine pits, and use of a variety of reclamation covers to prevent infiltration of surface water. Id. at 2-132 to 2-138, 2-145 to 2-148, 2-222 to 2-225.

The other three alternatives also contemplate expansion of the mines but differ in proposing alternative locations for major facilities. Because Zortman has announced it will not proceed with the mine expansion, these differences are no longer important. Reclamation measures for Alternative 7 are generally those identified under Alternative 3 as BLM's modifications of Zortman's reclamation plans, with variations in application and additional standards for facilities required for the mine expansion. Compare EIS at 2-225 to 2-234 with EIS at 2-92 to 2-101.

In reviewing the EIS and issuing its October 25, 1996, Decisions, BLM understood that two matters were of concern:

> The agencies must determine (1) how to mitigate impacts from existing mine operations, and (2) whether ZMI's proposed plans for expanded mining and mineral recovery are adequate to meet state and federal requirements, and if not, to identify any mitigating measures that would meet these requirements. The two decision processes are related in that mine expansion approval could change the options available for correcting impacts from the existing mine operations (that is not to say that mine expansion is necessary to achieve adequate reclamation of past mine disturbance). Therefore, these decisions have been considered in the same EIS.

(ROD at 2.) BLM approved the mine expansion and reclamation plans defined by Alternative 7 and imposed 61 stipulations as conditions of approval. Id. at 3, 33. In addition to stipulations drawn from its modifications of Zortman's reclamation plans identified under Alternatives 3 and 7, BLM required Zortman to "conduct mine activities in accordance with both the Water Quality Improvement Plan contained in Appendix A of the Final EIS and the Water Quality Improvement and Monitoring Compliance Plan (Compliance Plan) contained in Appendix A of the Consent Decree * * *." Id. at 11-12. 3/

3/ The CD states that Appendix A, the "Water Quality Improvement and Monitoring Compliance Plan," and Appendix B, the "Storm Water Management Plan," are contained in separate notebooks. (CD at 8, 11.) The record includes a "Water Quality Improvement and Monitoring Compliance Plan" dated July 1996 and a "Storm Water Management Plan for Zortman and Landusky Mines Sites Zortman Mining, Inc." dated August 1996. Both documents were prepared by Hydrometrics, Inc. of Helena, Montana and were received by BLM on Sept. 3, 1996.

Arguments on Appeal

The most extensive SOR was filed jointly by the Tribes, the Fort Belknap Community Council, and the NWF ("NWF SOR"). They raise numerous arguments related to three basic areas of law. They contend that the decision to approve the mine expansion violated the Federal Government's trust responsibilities by failing to consider impacts on the Reservation, its residents, and resources, that it failed to comply with NEPA, and that it violated BLM's duty under 43 U.S.C. § 1732(b) (1994) to "take any action required to prevent unnecessary or undue degradation" of the public lands. The Island Mountain Protectors also argue that BLM violated its duty to prevent unnecessary or undue degradation and did not properly consider Native American cultural matters ("IMP SOR").

Appellants' arguments were described in the June 16, 1997, Order granting a stay of the decision. It summarized Appellants' arguments concerning the Department's trust responsibility as follows:

> The Appellants criticize BLM for finding that the Federal Indian trust responsibility is not implicated by the proposed operation. (NWF SOR at 4.) They argue that the impacts mining will have on the water and air used by Tribal members and on their cultural practices, both on and off the Reservation, trigger BLM's trust responsibilities. (NWF SOR at 5-6.) They contend that BLM errs in claiming it satisfied its trust responsibilities by meeting the requirements of Federal laws and regulations. (NWF SOR at 7-8.) In particular, the Appellants argue that BLM has failed to meet its obligations under Executive Order (E.O.) 12898, 59 Fed. Reg. 7629 (Feb. 16, 1994), the Religious Freedom Restoration Act (RFRA), 42 U.S.C. § 2000bb (1994), and the National Historic Preservation Act (NHPA), 16 U.S.C. §§ 470-470w-6 (1994). (NWF SOR at 12-18.) In regard to the NHPA, they argue that the Programmatic Agreement (PA) BLM signed with Zortman and historic preservation officials is not appropriate and was not entered into in good faith under 36 C.F.R. pt. 800. (NWF SOR at 14-18.) Noting that the EIS states that the cumulative impact of mining operations will be "100 plus years of significant disruption to the Native American cultural practices" and that there will be permanent physical impacts to the Little Rocky Mountains, the Appellants claim that BLM violated its trust responsibilities by failing to gather adequate information about Native cultural resources that would be affected and address impacts in the EIS. (NWF SOR at 10-12 (quoting EIS at 4-316); IMP SOR at 10-11.) Additionally, the Island Mountain Protectors contend that the primar[]y ethnographic study on which the EIS relies was inadequate. (IMP SOR at 10-11.)
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> Appellants also claim that the expanded mining operation will divert water away from the Reservation in violation of their water rights recognized by Winters v. United States, 207 U.S. 564

> (1908). (NWF SOR at 9-10, 18-19.) They note that the EIS states that water will be diverted away from the drainage of Lodgepole Creek and that a "significant" amount of flow has already been diverted from King Creek, and they argue that the EIS inadequately addresses the impacts of additional operations. (NWF SOR at 19-20.) They assert that King Creek will be denied groundwater when the mine pits are deepened below the water table and "dewatered." (NWF SOR at 20-21.) Moreover, they argue, backfill placed in the pits will have a high potential for contaminating groundwater, which emerges as surface water on Reservation land, and that there will be a reservoir of contaminated underground water by the time any discharge is found. (NWF SOR at 20-22.)

(Order of June 16, 1997, at 5-6.)

Many of the issues about surface and groundwater Appellants raise in relation to the Department's trust responsibility are also presented as arguments about NEPA. They contend that the EIS inadequately discusses the potential for groundwater contamination and effects on the Madison aquifer. They assert that "too little is known about regional groundwater flow patterns for BLM to conclude that the mine will not impact northern watersheds * * *." (NWF SOR at 27.) They contend that the EIS' discussion of northern groundwater flows "is based on data from only three monitoring wells" and point out that it admits: "It is unclear if any groundwater discharges to the north due to the limited number of monitoring wells and the uncertainty concerning the exact location of the groundwater divide." Id. at 28, quoting EIS at 3-53.

Appellants state that a lack of information about groundwater was noted in the 1979 EIS and that DSL acknowledged a "lack of definite knowledge regarding the area's groundwater flow" in a May 1979 press release. Id. at 29. 4/ They argue that "BLM has made no effort to fill this information gap" despite issuing additional permits. Id. Appellants also contend that documents from 1987 and 1993 show that the fate of ARD entering groundwater at the mines was not known. Id. at 29-30. They point out

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4/ Although the 1979 EIS is not part of the record, see note 1, supra, page 36 was provided as an appendix to NWF's comments on the draft EIS. It states:

"There is little groundwater information available in the Zortman-Landusky area. * * * Although no formal investigation has been done concerning groundwater in the Little Rockies, past mining operations have encountered water at various levels and times, providing a general theory about groundwater occurrence, movement and discharge in the upper elevations, including the mining areas themselves."

A copy of the press release was also provided by NWF. (MTM-77778, Vol. 28f.)

that the EIS acknowledges that the Madison Group limestones "have received recharge by waters impacted by mining activities" and that, "due to the structural complexity of the Little Rocky Mountains, the potential for groundwater discharge to the north after backfilling the pits remains" and such water "may be of poor quality and may require capture and treatment." Id. at 30-31; EIS at 3-53, 4-67.

Appellants criticize BLM for concluding both that "additional groundwater information is not needed to make a decision regarding the reclamation and mine expansion plans," even though the mine pit would be expanded north and deepened below the water table, and also that "[t]he only additional groundwater data" needed is monitoring "to verify that expanded mining does not result in groundwater contamination in the northern drainages." (NWF SOR at 31, quoting ROD at 34.) Appellants assert that recent monitoring shows evidence of ARD contamination and that seeps indicate mine-impacted water containing elevated nitrate levels and heavy metals has reached Lodgepole and South Big Horn Creeks. Id. at 22, 32. They argue that additional information "could radically redefine the understanding of the hydrology of the Island Mountains." Id. at 32. In particular, they contend that the potentiometric [groundwater] divide presented in the EIS "is based on a questionable interpretation of inadequate data." Id. at 33. Appellants charge that, even though the EIS acknowledges the exact location of the divide is uncertain, BLM uses it "to assure residents to the North of the mine that there is little risk of impacts from expansion." Id., quoting EIS at 3-53.

Appellants also criticize BLM for using surface water quality to evaluate groundwater quality and charge that it is unreasonable "to attempt to protect groundwater solely by protecting surface water." Id. They acknowledge that the final EIS has a revised discussion of groundwater, but maintain that the changes "are essentially only the addition of 1995 water quality data." Id. at 34. Appellants contend that BLM cannot consistently attribute its lack of information to a lack of monitoring wells but nevertheless conclude it had adequate information to assess impacts. Id. They argue that the EIS lacks sufficient information for BLM to conclude that a significant percentage of ARD contaminated groundwater will be neutralized by limestone formations and to predict where contaminated water will emerge for capture and treatment. Id. at 34-35. Appellants assert that "BLM has not met its obligation under NEPA to fully disclose and analyze the nature of impacts" because it has only stated that they are foreseeable without identifying "what those impacts would be, what the magnitude of the impacts would be, nor how long they might last." Id. at 35-36.

Appellants raise a number of specific arguments challenging the EIS' finding that low permeability shales and the upward hydraulic gradients within the Madison Group Limestone reduce the potential for direct recharge once outside the Little Rocky Mountains. Id. at 36. They point out that the EIS acknowledges that after a heavy snow in May 1974, discharge at Big Warm Spring increased from 6 to 9 cubic feet a second and there was a change in water quality. Id., citing EIS at 3-108. They argue that

this event and the presence of seeps indicate that the EIS fails to adequately disclose and consider impacts on surface waters from contaminated groundwater. Id. at 37.

Appellants contend that, instead of releasing the EIS, BLM should have awaited completion of a groundwater study being conducted pursuant to the CD and implementation of the water quality monitoring program the decree mandates, which they believe would provide important information about infiltration rates. Id. at 28, 30. They point out that "the EIS repeatedly mentions a number of features such as faults, hydrothermal alternations, geologic contacts, and variable porosities that will all affect groundwater flows" and argue that an "[e]valuation of a fracture-controlled aquifer requires detailed structural and hydrologic analysis to determine groundwater flow directions and velocities." Id. at 33. Appellants believe that the groundwater study "could reveal groundwater flow patterns and volumes that would redefine or even negate many of the fundamental assumptions made in the EIS, necessitating a re-evaluation of impacts," and they contend that the EIS' "inadequate data and outright misstatements" prevented BLM from making an informed decision. Id.

Appellants argue that insufficient information about groundwater flows triggered 40 C.F.R. § 1502.22 and required BLM to (1) disclose scientific uncertainty, (2) undertake independent research unless the costs would be exorbitant or the means of obtaining the information not known, and (3) evaluate potential, reasonably foreseeable impacts in the manner defined by the regulation. Id. at 39. They assert that, because the groundwater study was underway, the costs of obtaining additional information were not exorbitant. Id. at 39, 42, 51. They argue that, having failed to await completion of the groundwater study, BLM must supplement the EIS to disclose the deficiencies in information and incorporate the findings of the study, as well as the Water Quality Improvement and Monitoring Compliance Plan, by evaluating potential impacts on groundwater. Id. at 31, 40-46, 51-52. 5/

Appellants raise other environmental issues. They argue that the EIS fails to properly examine mitigation measures for impacts on wetlands by relying upon a plan Zortman proposed in its permit application to the Army Corp of Engineers and that the plan's discussion of mitigation measures fails to address a number of concerns. Id. at 24-26. They contend that the EIS fails to adequately address impacts on bighorn mountain sheep resulting from the conveyor belt cutting their migration route and fragmenting their habitat. Id. at 61-62. The Island Mountain Protectors argue

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5/ Appellants raise similar arguments that BLM violated 40 C.F.R. § 1502.22 and must prepare a supplemental EIS to address the results of the aquatic resources study, community health study, study of bat populations, and ethnographic study of Native American cultural resources which are called for by the CD. (NWF SOR at 47-51.)

that the EIS inadequately addresses impacts on bats in Azure Cave, located near the proposed leach pad. (IMP SOR at 11-16.) Appellants also argue that the EIS does not adequately consider impacts resulting from possible failure of a waste rock facility. (NWF SOR at 64-65.) They contend that it fails to address whether limestone used to remediate ARD contains heavy metals and they argue that it does not identify areas where "water balance" covers are not appropriately used. Id. at 65-66. In addition, Appellants argue that the EIS does not adequately address airborne emissions of lead and particulate matter. Id. at 66-69.

Appellants' third primary area of argument is that BLM failed to take action to prevent unnecessary or undue degradation of the public lands. 43 U.S.C. §§ 1732(b), 1782(c) (1994); see 43 C.F.R. § 3809.0-5(k). They contend that BLM failed to consider the effects on cultural, water, and air resources used by the Tribes and, correspondingly, failed to develop reasonable mitigation measures. (NWF SOR at 53.) They also argue that BLM failed to comply with its policies governing cyanide heap leach mines which require obtaining information about groundwater and soil mechanics. Id. at 53-54. The Island Mountain Protectors stress that, given the history of cyanide and ARD problems at the mines and that expansion would increase ARD, BLM violated its duty by approving plans of operations without adequate information about groundwater. (IMP SOR at 8-9.) Appellants also argue that BLM failed to prevent unnecessary or undue degradation by approving plans of operations which do not assure compliance with environmental laws. (NWF SOR at 54-55.) They assert that the operations would result in violations of the Clean Water Act because, as recognized in the CD, Zortman lacks water quality permits for its current operations and, as recognized in the EIS, Zortman has destroyed wetlands without a permit. Id. at 55-56; IMP SOR at 9. In addition, Appellants claim that BLM failed to prevent unnecessary and undue degradation because the mine expansion will not meet the reclamation requirement of the Montana Constitution, will violate air quality standards, and does not protect Tribal water rights. (NWF SOR at 56-60; IMP SOR at 9.)

Review of the Motions

[1] The standard for mootness addressed by the parties and applied by the Board has been set forth in many of its decisions:

> An appeal should be dismissed as moot if, as a result of events occurring after the appeal is filed, the Board can give no effective relief. Wildlife Damage Review, 131 IBLA 353, 355 (1994); Oregon Cedar Products Co., 119 IBLA 89, 93 (1991). Admittedly, this rule, which we have borrowed from the courts, has an exception: The Board will not dismiss an appeal as moot if issues raised are, in the words of the United States Supreme Court in Southern Pacific Terminal Co. v. ICC, 219 U.S. 498, 515 (1911), "capable of repetition, yet evading review." See Oregon Cedar Products Co., supra. That an issue may occur again will

> not save an appeal from dismissal if future actions will be subject to review. See In Re Jamison Cove Fire Salvage Timber Sale, 114 IBLA 51, 53 (1990).

Jerry Hylton, 135 IBLA 369, 371-72 (1996).

Zortman and BLM view the cancellation of the mine expansion as nullifying BLM's Decisions and believe that the Board cannot grant any relief. 6/ They contend that the issues Appellants raise will not evade review because they may be raised, if still relevant, when Zortman submits its final reclamation plans and BLM issues a decision addressing them. Appellants point out that BLM's Decisions already address reclamation of the mine sites. They argue their appeals challenge the effectiveness of the specific measures BLM approved and the adequacy of the EIS, particularly as it addresses groundwater. They contend that the Board may grant effective relief by requiring BLM to develop different reclamation measures or undertake additional environmental study.

Unlike many appeals the Board has dismissed as moot, the Decisions appealed have not been acted upon and completed. See, e.g., Southern Utah Wilderness Alliance, 137 IBLA 24 (1996); Wildlife Damage Review, 131 IBLA 353 (1994). Nor does Zortman have an option of deciding whether to submit further amendments to its plans of operations. It is responsible for reclaiming prior disturbances and cannot rely upon previously approved reclamation plans because the Montana State Director has determined they are inadequate to address ARD. The significant modifications for long term prevention, control, and treatment of ARD which Zortman proposed for the Landusky Mine were not approved by the District Manager's February 25, 1994, decision pending review in the EIS. The corresponding "Alternative Reclamation Plans for the Zortman Mining Area" (January 1994) were also subject to review in the EIS and BLM approval or modification. See Red Thunder, Inc., supra, at 240-41, 101 I.D. at 64-65. In the meantime, BLM must supervise ongoing operations to maintain the mine sites so that they ultimately may be reclaimed.

Neither Zortman nor BLM has suggested any reason to believe that the final reclamation plans Zortman proposes will be fundamentally different from those at issue in the present appeal. Although the reclamation measures described under Alternative 7 and imposed by the stipulations were selected based upon approval of the mine expansion, they include reclamation measures set forth under Alternative 3 as BLM's modification of Zortman's reclamation plans without expansion of the mines. Compare EIS at 2-92 to 2-93 with EIS at 2-225 to 2-227. Presumably, the types of

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6/ Although Zortman apparently has not submitted a written request withdrawing the plans of operations which were the subject of the EIS, the ROD, and BLM's Oct. 25, 1996, Decisions, there is no reason to question its announcement that it is cancelling expansion of the mines, and both BLM and Zortman indicate that the company will submit final reclamation plans.

drainage ditches, diversion channels, "water balance" and "water barrier" reclamation covers, standards for classifying waste material, reclamation slopes, and backfill procedures BLM has developed and deemed desirable under both alternatives are also measures Zortman will propose, or BLM will require, in the final reclamation plans. Those plans may vary in some respects from those reviewed in the EIS, but the design of the reclamation plan and the specific measures to be implemented are likely to be much the same.

In addition to Zortman's plans to expand the mines, the EIS was prepared to address the company's proposed modifications to respond to ARD and long-term reclamation practices to correct the problems with ARD that had developed at the mines. 59 Fed. Reg. 16656 (Apr. 7, 1994); ROD at 2. Unless BLM prepares another EIS, it will be a primary document upon which BLM's decision on Zortman's final reclamation plan is based and to which any supplemental document is tiered. See Southern Utah Wilderness Alliance, 123 IBLA 302, 305-07 (1992). To the extent Appellants raise arguments challenging its adequacy and the effectiveness of the reclamation measures BLM has approved, not all issues they have raised are moot and Zortman's announcement does not preclude granting effective relief. See Powell v. McCormack, Speaker of the House of Representatives, 395 U.S. 486, 496-97 (1969). Appellants continue to have "a legally cognizable interest in the final determination of the underlying questions of fact and law." County of Los Angeles v. Davis, 440 U.S. 625, 631 (1979). Zortman's motion to dismiss the appeals as moot is denied in part.

The fact BLM must have jurisdiction to review Zortman's final reclamation plans is not sufficient to remand the appeals without providing Appellants the review by this Board to which they are otherwise entitled. Zortman's and BLM's reliance on an opportunity to appeal a decision addressing the final reclamation plans misconstrues the standard for mootness. The initial question is whether the Board may grant effective relief. If it cannot, the appeal is moot and the further question arises whether there are issues "capable of repetition, yet evading review." See, e.g., BLM v. Thoman, 139 IBLA 48, 54 (1997); Jerry Hylton, supra; see also Weinstein v. Bradford, 423 U.S. 147, 149 (1975) (per curium). The fact issues which have been raised might be reviewed in a later appeal is not a basis for finding that relief cannot be granted in the present appeal. To the contrary, delay in addressing viable issues Appellants have raised would require Zortman and BLM to proceed with reclamation planning in the face of unresolved legal issues, complicate ongoing work to maintain the mine sites pending reclamation, and potentially affect their timely and proper reclamation. As discussed below, it would potentially result in a BLM decision based on an inadequate review of environmental impacts due to a lack of information about groundwater flows at the mine sites and require granting the same relief at a later date.

Issues on Appeal

Although we find the appeals are not moot, Zortman's decision to cancel expansion of the mines nullifies many of the arguments Appellants

raise. Most obviously, arguments that the EIS does not adequately address impacts the conveyor belt would have on bighorn mountain sheep and effects of the leach pad on bats in Azure Cave are without consequence if those facilities are not constructed. Similarly, Appellants' arguments that expansion of the mine will adversely affect air quality and Tribal water rights need not be addressed. 7/

Other arguments, while not clearly moot, have a different context as a result of Zortman's announcement and are not appropriately addressed at this time. Cancellation of the mine expansion changes both the area where cultural resources may be directly affected and the effects which may occur to resources outside the mine sites. When BLM issues a decision on the final reclamation plans, its compliance with the procedural requirements of the NHPA will stand in a different posture than in the present appeal. Consequently, no purpose would be served in addressing issues about either the substantive adequacy of BLM's review of Tribal cultural resources or the procedure by which the PA was adopted. Likewise, there is no need to address Appellants' arguments about the development of mitigation measures for impacts on wetlands and their adequacy because mitigation requirements will change with the cancellation of the project. Appellants' arguments concerning Exec. Order No. 12898 and RFRA also have different import by cancellation of the mine expansion. 8/

Trust Responsibility

Although there is no need to address the Appellants' argument that BLM violated its trust responsibility by selecting Alternative 7, they also argue that BLM misstates its trust responsibility in asserting that it was not implicated because Tribal lands are not part of the permitted area and in concluding that its trust responsibility was satisfied by complying with Federal laws and regulations. (NWF SOR at 3-8; see EIS at 6-188, response to cmt. 3, EIS at 6-197, responses to cmts. 36 and 37.) They are correct.

As noted in the June 16, 1997, Stay Order, the ROD seems inconsistent. One paragraph addressing 512 DM 2.1 (Rel. No. 3049, Dec. 1, 1995), which requires consultation with Indian tribes "whenever plans or actions affect

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7/ The June 16, 1997, Stay Order stated at page 12: "Given the basic principle of beneficial use which governs Western water law, BLM's and Zortman's argument that Winters v. United States, supra, does not prohibit non-Tribal uses appears to have merit. Usually, however, we are hesitant to address issues about Montana water law more appropriately resolved by a Montana court."

8/ BLM addressed Exec. Order No. 12898 in the ROD at 42-45. Appellants assert that it should have been addressed in the EIS but do not provide authority for the claim. (NWF SOR at 12-14). On the other hand, a response to a comment about a draft EIS cannot be considered equivalent to substantive factual review in the analytical sections of an EIS. See ZMI Answer at 25-26, EIS at 6-194, response to cmt. 26.

tribal trust resources, trust assets, or tribal health and safety," states that "no such affect [sic] has been identified" but that BLM had consulted with the Fort Belknap Community Council. (ROD at 45.) The next two paragraphs, however, assert that approval of Zortman's plans of operations was "consistent with BLM's trust responsibilities" and that, having "analyzed the potential impacts that will occur to all aspects of the human environment both on and off the Fort Belknap Reservation," mitigating measures "minimize the potential offsite impacts of mine expansion to affect trust resources" and there will be "[n]o impacts to trust resources" requiring the Department "to exercise special protective measures under its trust responsibilities to Native Americans." Id. Obviously, in order for BLM to analyze potential impacts on the Reservation, determine that mitigation measures protect trust resources, and find that special protective measures are not needed, BLM had to first conclude that the proposed operations would affect trust resources.

[2] The parties' legal arguments address different matters. Zortman is correct that Independent Petroleum Association of Mountain States, 136 IBLA 279, 291 (1996), aff'd, Civ. No. 96-CV-0253-J (D. Wyo., Jan. 28, 1998), recognizes that BLM was not required to select a particular alternative unless a specific provision of a treaty, agreement, executive order, or statute required it to give a preference to the Tribes. (ZMI Answer at 7-8.) Appellants, however, do not argue that BLM was required to select a particular outcome. Rather, they contend that BLM failed to adequately protect tribal interests and give "priority and independent consideration to Indian tribes that are affected by its decision." (NWF SOR at 6, 9.) In addition to a mandate found in a specific provision of a treaty, agreement, executive order, or statute, any action by the Government is subject to a general trust responsibility. United States v. Mitchell, 463 U.S. 206, 225 (1983); Nance v. EPA, 645 F.2d 701, 710-11 (9th Cir. 1981); The Havasupai Tribe v. United States, 752 F. Supp. 1471, 1486 (D. Ariz. 1990), aff'd, 943 F.2d 32 (9th Cir. 1991), cert. denied, 503 U.S. 959 (1992); see F. Cohen, Handbook of Federal Indian Law, Ch. 3, § C2c (1982 ed.). Appellants are correct that BLM had a trust responsibility to consider and protect Tribal resources. "[A] federal agency's trust obligation to a tribe extends to actions it takes off a reservation which uniquely impact tribal members or property on a reservation." Northern Cheyenne v. Hodel, 12 Indian L. Rep. 3065, 3071 (D. Mont. 1985), 851 F.2d 1152 (9th Cir. 1988) (review of injunction). Neither they, nor the cases they cite, however, specify the manner in which BLM should have reviewed Zortman's proposed plan of operations in order to give "priority and independent consideration" to tribal interests while meeting its other legal obligations. See National Wildlife Federation v. BLM, 140 IBLA 85, 102 (1997).

BLM's reliance on North Slope Borough v. Andrus, 642 F.2d 589 (D.C. Cir. 1980), aff'g in part and rev'g in part, 486 F. Supp. 332 (D.D.C. 1979), to argue that it met its trust responsibility by "compliance with federal laws and regulations designed to protect the environment" is misplaced. (BLM Answer at 13-15.) The district court noted, and the circuit court agreed, that "[a] trust responsibility can only arise from a statute,

treaty, or executive order." Id. 642 F.2d at 611, 486 F. Supp. at 344. The Inupiats, the group affected by the action at issue, did not have a treaty with the Government. The district court found, however, that the Marine Mammal Protection Act and the Endangered Species Act (ESA), 16 U.S.C. §§ 1371(b), 1539(e) (1994), imposed "a trust responsibility to protect the Alaskan Natives rights of subsistence hunting" and that "to the extent the Secretary has not complied with the Endangered Species Act, he has also shirked his trust responsibility to the Inupiats." 486 F. Supp. at 344. The circuit court disagreed that the Secretary had violated the ESA. 642 F.2d at 611. As BLM points out, it also stated:

> By confining the extension of "trust responsibility," however defined and whatever the source, to the area of overlap with the environmental statutes, the district court was arguably consistent with the Supreme Court's rationale in United States v. Mitchell. Without an unambiguous provision by Congress that clearly outlines a federal trust responsibility, courts must appreciate that whatever fiduciary obligation otherwise exists, it is a limited one only.
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> * * * * * * *
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> All of the environmental statutes, particularly ESA, structure and prescribe for the Secretary a solicitous stance toward the environment. Hence, where the Secretary has acted responsibly in respect of the environment, he has implemented responsibly, and protected, the parallel concerns of the Native Alaskans. In sum, the substantive interests of the Natives and of their native environment are congruent. The protection given by the Secretary to one, as we have held, merges with the protection he owes to the other.

Id. at 612. BLM overlooks the fact that the Tribes hold treaties with the Federal Government while the Inupiats did not. See Northern Cheyenne v. Hodel, supra, at 3071. The treaties predate NEPA and other environmental laws. While the trust responsibility created by environmental laws may be "congruent" with other duties they impose, the enactment of those laws does not diminish the Department's original trust responsibility or cause it to disappear. BLM was required to consult with the Tribes and to identify, protect, and conserve trust resources, trust assets, and Tribal health and safety in making its October 1996 decisions. It will be required to do so on remand and to report on its actions in issuing a decision on the final reclamation plans. 512 DM 2.4.

Groundwater

Regulations issued by the Council on Environmental Quality govern the scope and preparation of an EIS. Appellants' arguments concerning the adequacy of the EIS' review of groundwater focus on 40 C.F.R. § 1502.22 which provides:

> When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking.
>
> (a) If the incomplete information relevant to reasonably foreseeable significant adverse impacts is essential to a reasoned choice among alternatives and the overall costs of obtaining it are not exorbitant, the agency shall include the information in the environmental impact statement.

If the costs of obtaining the information are exorbitant "or the means to obtain it are not known," the regulation requires an agency to include in the EIS:

> (1) A statement that such information is incomplete or unavailable; (2) a statement of the relevance of the incomplete or unavailable information to evaluating reasonably foreseeable significant adverse impacts on the human environment; (3) a summary of existing credible scientific evidence which is relevant to evaluating the reasonably foreseeable significant adverse impacts on the human environment, and (4) the agency's evaluation of such impacts based upon theoretical approaches or research methods generally accepted in the scientific community.

40 C.F.R. § 1502.22(b). 9/

Although the EIS reports that "an extensive data base of information exists concerning the geology of the Little Rocky Mountains and the ore deposits contained therein" (EIS at 3-1), the parties agree that BLM had limited information about groundwater flows in the vicinity of the mines. The EIS is replete with acknowledgements that the number and location of groundwater monitoring wells made the precise nature of groundwater flows, the location of the potentiometric divides, and the extent of groundwater flow north toward the Reservation uncertain. Id. at 3-49, 3-51, 3-53,

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9/ Appellants cite Save Our Ecosystems, Inc. v. Clark, 747 F.2d 1240 (9th Cir. 1984), and Southern Oregon Citizens Against Toxic Sprays, Inc. v. Clark, 720 F.2d 1475 (9th Cir. 1983), cert. denied, 105 S. Ct. 446 (1984). Both decisions were issued prior to the amendment of 40 C.F.R. § 1502.22 when it required a worse case analysis. See 51 Fed. Reg. 15618 (Apr. 25, 1986). While the current version is otherwise similar to the earlier one, the Supreme Court's conclusion in Robertson v. Methow Valley Citizens Council, 490 U.S. at 355, that the regulation was not a codification of prior judicial decisions makes application of those decisions uncertain. Nevertheless, courts have long recognized that NEPA requires an agency to obtain needed information. See Save Our Ecosystems, Inc. v. Clark, supra, at 1248-49.

4-45, 4-56, 4-67. Consequently, the issue presented by the regulation is not whether BLM failed to make clear that information was lacking. Nor is there a question whether the costs of obtaining additional information were exorbitant. Neither BLM nor Zortman suggests there was a financial impediment to conducting additional groundwater study. Rather, the issue is whether the information was so limited that BLM was unable to adequately assess reasonably foreseeable significant adverse impacts and, therefore, was required to obtain additional information about groundwater or, alternatively, provide the analysis outlined in 40 C.F.R. § 1502.22(b). "Reasonably foreseeable" is defined to include "impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason." 40 C.F.R. § 1502.22(b); see 51 Fed. Reg. 15618, 15622-23 (Apr. 25, 1986).

Based upon the record before us, we agree with Appellants that "incomplete or unavailable information" about groundwater flows precluded BLM from adequately evaluating reasonably foreseeable significant adverse effects on the human environment and that BLM was required to obtain additional information or, alternatively, provide the analysis outlined in 40 C.F.R. § 1502.22(b). In particular, the record discloses that BLM understood that the gold and other minerals present at the mine sites had been deposited through the faults, fractures, shears, and other features within the Little Rocky Mountains and that those same structures influence the flow of groundwater. Although several studies of groundwater were conducted, comments by BLM and DSL in reviewing the proposed amendments to the plan of operations for the Zortman Mine show that the agencies deemed them insufficient and believed that additional information was needed. In addition, the record reflects that information about the specific location of various geologic structures at the mine sites was available and, as evidenced by a May 1995 study of the August Pit, could be used to evaluate groundwater flows. Except as drawn from that study, however, the EIS does not provide the analysis of possible impacts on groundwater which was essential to a reasoned choice among alternatives.

As described in the EIS, faults, fractures, and shears were the entry through which mineralization occurred. After describing the geology of the area, the EIS turns to the origin of the mineral deposits:

> After upwelling and emplacement of the igneous magmas, a hydrothermal system dominated by low pH, low salinity waters heated by the igneous magma developed (Russell 1991b). * * * Hydrothermal flow of the heated waters was channeled along the existing structural trends of the intrusive rocks. Gold, silver, and associated minerals such as pyrite were dissolved in the hot water because of the low pH. Changes in pressure, fluid chemistry, or reductions in temperature could cause the pH of the water to increase, resulting in precipitation of gold and minerals. The minerals were typically distributed within the structural channels, often in dikes or veins of quartz, or along fracture zones of crushed and broken rock called breccias.

(EIS at 3-5.) The EIS reports that most gold production has come from low grade deposits of 0.022 to 0.028 ounces per ton, "although even lower grades have been mined at Landusky," and that the deposits:

> occur in the altered syenite porphyries, and are associated with high-angle faults or fractures, the channels along which mineralized hydrothermal waters had access. At the Zortman Mine, gold mineralization has been concentrated at the intersections of north and northwest-trending mineralized fractures, and occurs as finely disseminated particles. To date, the most important ore bodies have been within the porphyry-hosted "breccia" dikes, the rock-type resulting from crushing and grinding along a fault or fracture. Sulfide mineralization in the OK Breccia, a mineralized breccia 15 to 100 feet wide emplaced along a northwest-trending fracture, extends from the surface to an average depth of 500 feet. In the Landusky area, economically viable gold deposits are found where the number and/or extent of fractures is greatest.

Id. at 3-5 to 3-6; see fig. 3.1-4, at EIS 3-8.

The EIS reports that faults, fractures, and shears are equally important in controlling the flow of groundwater. It states that "[f]aulting and fracture systems which are both radial and tangential to the intrusive core control the outward flow of groundwater" and that "solution cavities and other karst features common to carbonate rocks also control groundwater flow." Id. at 3-48. In general, the EIS reports that groundwater "moves slowly downslope through the intrusive rocks. Groundwater flow paths are complex and are controlled by the presence and alignment of open fractures." Id. Fault structures near the Zortman Mine

> generally trend north-northeast are steeply dipping and appear to be confined to the intrusive body. The north-northeast oriented shear zones include Ruby, Ross, and O.K. shear zones. Breccia dikes and veins are also present in many of the mine workings at Zortman; most notably within the O.K. and Ruby Pits.

Id. at 3-49. The EIS notes that "[t]he Zortman mining area is underlain by numerous underground openings and workings," but they are "above the static groundwater table and convey only transient groundwater flow." Id. At Zortman, "most of the groundwater recharged in the pits flows southeasterly towards Ruby Gulch, possibly along fractured rock pathways resulting from faulting of the porphyry intrusive rock." Id. at 3-51. Despite an apparent "preferred groundwater flow path between the pits and Ruby Gulch," the EIS notes that some groundwater may drain to the north, but, because there are only two bedrock monitoring wells north of the Zortman pit complex, "it is not certain that no impacted groundwater is currently flowing to the north." Id. at 3-51, 3-53. "Another component of groundwater flow is a deep, near-vertical recharge route into the porphyry bedrock and eventually into the sedimentary formations surrounding the Little Rocky Mountains." Id. at 3-51.

The EIS reports that at the Landusky Mine:

> The principal structural controls * * * appear to be the northeast oriented shear zones, principally the Gold Bug, Suprise Niseka and August shears, and the smaller sympathetic fracture systems in the direction of shearing (Water Management Consultants 1995). The shear zones have areas of greater fracture density which may result in enhanced hydraulic conductivity. If so, the fracture system may act as a conduit imparting a preferred southwesterly orientation for groundwater flow through the mine area.

Id. at 3-49. Nevertheless, the EIS notes that there is evidence that the "water in the Suprise Shear Zone is draining naturally to the northeast, towards Peoples Creek" and "spring L-20 may represent a natural discharge zone for groundwater in the Suprise Shear Zone." Id. at 3-51, 4-50. The EIS also reports that "[a] zone of higher (perched) groundwater elevations has been encountered in the Narrows Fault Zone" which may drain to spring L-5 on King Creek, that "seeps in the headwaters of Montana Gulch are consistent with groundwater elevations in the intrusive rocks along the line of the August Shear Zone," and that spring L-8 in Mill Gulch "is likely related to groundwater flow in the intrusive rocks along the Gold Bug shear zone." Id. at 3-51.

The EIS explains the relationship between surface water and groundwater as follows:

> In the upper parts of the Little Rocky Mountains, groundwater infiltrates directly into the unsaturated syenite porphyry rocks. Construction of the open pits, heap leach and waste rock piles has increased the land surface area available for direct infiltration and proportionally reduced the amount of direct runoff to surface water drainages. The enhanced infiltration increases the volume of water available to interact with the rock (bedrock and waste rock, spent ore etc.) and thus increases the potential for generation of ARD. A percentage of the groundwater infiltrating into the pits flows towards, and then discharges to the streams and valley alluvium through springs and seeps located in the upper reaches of the drainages. * * * Groundwater flow from the pits towards the valleys is possibly facilitated by enhanced permeability along faulted and brecciated zones. Another portion of the recharge infiltrates vertically into the syenite porphyry bedrock. This near vertical flow path will eventually contribute to the recharge of the Madison Group limestones or its overlying sedimentary formations.

Id. at 3-106; see at 3-108, 3-109. In addition, the EIS reports that recharge to the Madison Group limestones may occur by infiltration from streams where the limestones are at or near the surface and is "facilitated by the downward vertical potential within the limestone at these locations." Id. at 3-108.

As noted in the June 16, 1997, Stay Order, ARD has been discharged into surface water at both mines and has infiltrated into groundwater, particularly in the Ruby Gulch drainage. See EIS at 3-45, 3-92, 3-98 to 3-99, 3-104 to 3-106, 3-109. The EIS acknowledges that

> water quality in the majority of the southern drainages within the Little Rocky Mountains has been adversely impacted to some degree by mining activity. Geologic materials and mine wastes derived from past and present mining operations have generated acid rock drainage and released these products to surface water and groundwater.

Id. at 4-38; see at 3-87 to 3-106 (groundwater quality monitoring results) and 3-118 to 3-124, table 3.2-3.2 (summary of existing conditions). The EIS explains that rock redistributed from the mine pits to heap leach pads and waste rock facilities "has significantly increased the amount of potentially acid generating rock exposed to the atmosphere, thereby accelerating the rate of weathering and geochemical reactions that have a negative impact on surface and groundwater quality." Id. at 4-38. It finds that, "[w]ith the exception of Lodgepole Creek, all the major drainages in the vicinity of the Zortman mine have been significantly impacted by mining activities" and that all major drainages at the Landusky Mine "have been impacted to some degree by mine drainage and/or release of process chemicals." Id. The EIS also acknowledges that "Madison limestone exposed at or near the surface in the Little Rocky Mountains has received ARD contaminated recharge due to upstream mining activity." Id. at 3-117; see at 3-53, 3-92, 3-98, 4-44.

The record indicates that the EIS' discussion of groundwater was drawn from three studies. The earliest is the "Baseline Water Resources Monitoring Plan," dated April 1992 and revised April 1993, by Hydrometrics, Inc. of Helena, Montana. (Zortman POP, Vol. 5, app. 8.) It reports that 10 monitoring wells were completed between September 1990 and February 1991 "to determine the groundwater quality and aquifer characteristics in the proposed mine extension area" and that 4 wells (ZL-200, ZL-201, ZL-202, and ZL-207) were completed in the OK, Ruby Ross, and Mint pits at Zortman "to determine the amount and quality of groundwater that could possibly flow into mining pit areas should the pits be deepened by extension mining activities." Id. at 4-1. The study states that the "[o]ccurrence and distribution of groundwater in the Zortman and Landusky areas are closely related to both local and regional geology" and that "[f]aults and fractures are the principal paths for groundwater recharge and movement * * *." Id. at 4-3, 4-5. Specifically, the study finds that the recharge of springs on the flanks of the mountains "is evident by the quick reaction of these springs to precipitation events in the mountain range," that groundwater near the town of Zortman generally flows southeast, and that "surface water and alluvial groundwater contribute recharge to the Madison Limestone" and "[t]here is a strong potential for recharge from alluvial aquifers to the Mission Canyon limestone, which has numerous solution cavities in its upper part * * *." Id. at 4-5, 4-6, 4-14. The

report, however, indicates that a majority of the wells were dry or not tested in each of the 6 monthly tests. Id. at 4-1, 4-15. Completion and lithologic well logs accompany the study and a map of the potentiometric surface shows a maximum elevation of 4,800 feet north of well ZL-200, which is shown at 4,772 feet. Id. at 4-10, 4-14, fig. 4-2, App. 5.

The second study is the "Hydrologic Study of the OK and Independent Open Pits" (Dec. 12, 1992) by Hydro-Geo Consultants, Inc. of Lakewood, Colorado. (Zortman POP, Vol. 7, App. 24.) It was undertaken because excavation of the pits below groundwater levels would "cause ground water inflow into the pits during operation and partial flooding of the pits after the completion of mining." Id. at 1. The company initiated a program "designed to test the aquifer characteristic in the pit expansion area particularly in the area of the shear zones." Id. Although it conducted additional permeability tests, the same four wells (ZL-200, ZL-201, ZL-202, and ZL-207) were used to establish a potentiometric surface. Id. at 2. The map identifies the groundwater divide at 4,757 feet in November 1992 and shows the location of shear zones crossing the mine pits north-south and east-west. Id., fig. 1, project area map. Among other matters, the study concludes that backfilled mine pits will become saturated from precipitation, surface water runoff, and ground water inflow "to a level near the pre-mining potentiometric surface elevation." Id. at 6, 8. It uses maximum estimated inflow in calculations "to account for the potential higher hydraulic conductivity in the area of the intersection of the two shear zones" which could "have a great impact on the ground water inflow during and after mining." Id. at 13. It also states that "shear zones with substantially higher permeability than the surrounding rock could change the inflow rates during and after mining * * *." Id.

The third groundwater study, prepared by Water Management Consultants, Inc., of Denver, Colorado, and titled "Preliminary Assessment of Groundwater Conditions for the Expanded August Pit" (May 1995), was based upon a variety of tests using six test holes. Id. at 3-4. It identifies the dip and strike of four northeast tending faults associated with mineralization at the Landusky Mine (the Gold Bug, Suprise, Niseka, and August Shears), an unmineralized northwesterly Narrows Fault with associated structures, and the presence of roof pendant rocks and localized folds. Id. at 13-14 and fig. 2.3. The study states that, while "water table elevations within and surrounding the range broadly mimic the surface topography, * * * [f]aulting and fracture systems which are both radial and tangential to the intrusive core control the outward flow of groundwater." Id. at 17. It also states that "[g]roundwater flow paths are complex and are controlled by the presence and alignment of open fractures. A knowledge of the geologic structures is therefore important for understanding the detailed hydrology around the August Pit." Id. at 19. Based upon data collected in March 1995, the study finds that "[g]roundwater elevations in the bedrock in the vicinity of the August Pit range from about 4,625 ft to 4,634 ft" but that a zone of higher groundwater elevations had been found in blast holes in the Narrows Fault Zone "roughly consistent in elevation with the spring at the head of the King Creek drainage" (4,720 feet) which appears to be a perched water table in roof pendant rocks. Id. at 20-21.

More particularly, the study describes the four shear zones as the "principal control on groundwater flow in the syenite porphyry intrusive rock." Id. at 21. It notes that one test hole may indicate that some drainage from the ore zone is "occurring to the southwest, towards Montana Gulch, because of the hydraulic connection along the shear zones" and that another "may indicate that water in the Suprise Shear Zone is draining naturally to the northeast, towards Peoples Creek." Id. In addition:

> The spring at L-20 could possibly be related to groundwater within the intrusives of the Suprise Shear Zone. Spring L-5 in King Creek could be the result of the perched water in the roof pendant rocks. Some of the seeps and springs in the headwaters of Montana Gulch are consistent with groundwater elevations in the intrusive rocks along the line of the August Shear Zone. In Mill Gulch, Spring L-8 occurs at an elevation of approximately 4,450 ft. This spring may also be related to groundwater in the intrusive rocks along the Gold Bug Shear Zone.

Id. at 22. The study analyzes dewatering of the mine pits during operations, hydrology of the final pit, and the consequences of backfilling the pit. It notes the need for additional data, but finds "there would always be a slight hydraulic gradient towards the backfill material, so flow would always be from the wall rock to the backfill material and into the August Drain Adit." Id. at 34. Because "the backfilled pit would act as a localized groundwater sink," however, "if the permanent drainage system to the August Drain Adit is engineered correctly, flow from the backfilled pit into the local groundwater system would not occur" and a properly designed cap could "effectively prevent in-pit runoff water from entering the underlying backfill material." Id.

One other groundwater study was submitted to the Board. Prepared by Hydrometrics, Inc. of Helena, Montana, and titled "Evaluation of Groundwater Resources in the Zortman and Landusky Mine Area Phillips County, Montana" (May 1995), its two binders are marked "Privileged and Confidential Communication in Anticipation of Possible Settlement." The volumes are not date-stamped or marked as received by BLM. The study explains that Zortman had submitted a draft "Water Quality Improvement and Monitoring Compliance Plan" to the Montana Department of Health and Environmental Sciences (MDHES) in October 1994 detailing "tasks and a schedule whereby ZMI will achieve compliance with Montana water quality regulations in anticipation of settling litigation between MDHES and ZMI" and that MDHES had requested "a comprehensive compilation and evaluation of existing information on groundwater resources in the mine areas." Id. at 1-1. The study appears to have been based upon 50 wells at the Zortman Mine and 21 wells at the Landusky Mine. Id. at 6-2, 6-10.

The EIS does not explicitly refer to the "Evaluation of Groundwater Resources," it is not identified in the list of references, and neither BLM nor Zortman identifies it in their briefs as a document supporting the EIS. See 40 C.F.R. § 1502.24; EIS ch. 7; cf. ZMI Answer at 32. Responding to a

comment that the "[e]valuation of a fracture-controlled aquifer requires detailed structural and hydrologic analysis to determine groundwater flow directions and velocities" and the draft EIS did not indicate "that such analysis has been performed," BLM cited the studies of the August Pit and the OK and Independent pits to state that "[e]xisting and potential impacts can be assessed based upon existing information" but did not refer to the "Evaluation of Groundwater Resources." (EIS at 6-126 to 6-127, cmt. 150 and response.) Another comment mentioned the study, but BLM responded that it had "determined that all data necessary to prepare the EIS and to make a reasoned choice among alternatives are currently available." Id. at 6-41, cmt. 1 and response. Consequently, it appears that neither the EIS nor the Decisions on appeal were based upon the "Evaluation of Groundwater Resources." 10/

Under the applicable regulations, Zortman's proposed modifications to its plans of operations were to be reviewed by BLM as though they constituted an initial application. 43 C.F.R. §§ 3809.1-7(b), 3809.1-6. Under the Montana Metal Mine Reclamation Act, the application was to be treated as an amendment of Zortman's operating permits and reviewed for any deficiencies. Mont. Code Ann. pt. 3, ch. 4, tit. 82. BLM and DSL formed a team to review the application for completeness. (MTM-77778, Vol. 7.) The record of their comments reveals that BLM understood that additional study was needed to identify the specific features controlling groundwater flows at the mine sites.

The first completeness review, sent to Zortman on June 22, 1992, found the application incomplete and identified specific deficiencies and questions. Referring to the "Baseline Water Resources Monitoring Plan," it noted that the monitoring wells were in the Goslin Gulch and Ruby Creek drainages while the proposed pit would extend into the Lodgepole Creek drainage and requested that Zortman: "Please include Lodge Pole Creek drainage in groundwater characterization and monitoring studies as it is potentially affected by the proposal." (MTM-77778, Vol. 8, at 16, cmt. 162.) The agencies also noted that Zortman's application had "stated that 54 core holes penetrated the potentiometric surface in the OK and Mint Pit areas" and requested the company to "incorporate these core hole locations

10/ The ROD acknowledges that "a groundwater study is included in the recent settlement of water quality litigation," but states that additional "information is not needed to make a decision regarding the reclamation and mine expansion plans." (ROD at 34.) The "study" referred to is not the "Evaluation of Groundwater Resources" but the "comprehensive study of potential impacts of releases of Mine Wastewater to Ground Water" the CD requires. (CD, VII.15.a at 33.) That study is also called for by the final "Water Quality Improvement and Monitoring Compliance Plan" Zortman submitted in July 1996. (App. C at C-1.) The work was to have been completed by Dec. 31, 1997, and a draft summary report was due Mar. 1, 1998. (App. C at C-5.)

and water level data into" the potentiometric surface map and "the discussion on groundwater movement." Id. at 16, cmt. 152; see cmt. 24, at 3. In addition, it stated: "The section on hydrogeology should include a detailed description and map of the important hydrostratigraphic units in terms of recharge and discharge areas, hydraulic characteristics, flow velocity and direction, and water quality." Id. at 17, cmt. 163. Zortman submitted its responses on September 14, 1992.

BLM's and DSL's second completeness review in October 1992 accepted Zortman's response that the core hole wells did not provide reliable data to determine a potentiometric surface but noted that "[a]lthough 123 of the 177 core holes were logged as `dry,' they may have terminated below the potentiometric surface in rock of low permeability" and requested that Zortman "please re-examine them to determine whether water has collected in them or if the[y] are indeed above the potentiometric surface." The agencies also requested Zortman to "provide a map (preferably a topographic map) indicating the locations of all core holes" and show "the outlines of the current and proposed pit and the potentiometric surface, as indicated by data from all 58 holes [the 54 holes that may have terminated below the potentiometric surface plus monitoring wells ZL-200, ZL-201, ZL-202 and ZL-207]." (MTM-77778, Vol. 9, at 4-5, cmt. 25.) The agencies agreed that water table information from the core holes was "very questionable," but pointed out that, as a result, "[o]nly the four potentiometric surface elevations from the monitoring wells are reliable. More data needs to be acquired." Id. at 5. They informed Zortman: "The four monitoring wells in the area of the proposed pit do not provide adequate baseline data. Please propose a network of monitoring wells beyond the perimeter of the proposed pit area (A minimum of one monitoring location per 1000 feet is recommended.)" Id. at 5, cmt. 26. The agencies again pointed out that the hydrology section "should include a detailed description, map, and cross-sections of the important hydrostratigraphic units in the vicinity of the mine, in terms of recharge and discharge areas, hydrologic characteristics, flow velocity and direction, and water quality." Id. at 14, cmt. 68. Zortman submitted its responses on December 23, 1992.

The agencies' third completeness review, dated January 21, 1993, stated that additional monitoring wells were "needed to establish baseline conditions outside the eventual perimeter of the proposed pit. At least 6 months of data is necessary." (MTM-77778, Vol. 11, letter of Jan. 21, 1993, at 2, cmt. 9.) BLM and DSL stressed:

> The construction of additional monitoring wells before any new expansion of major facilities will allow for a point of reference from which to draw conclusions about ground water flow and quality before and after mining. It is imperative [that] new monitoring points be established now, not at some point in the future. A monitoring plan is also needed.

Id. The agencies rejected Zortman's suggestion that there were "a sufficient number of monitoring wells in the pit area to accurately determine the

static water level," noting that the six additional wells Zortman had identified in its response were southeast of the pit in Ruby Gulch and that "[s]ome are a mile away * * * and several hundred feet lower in elevation." Id. at 6, cmt. 41. The agencies again requested that Zortman "consult with the agencies and install additional wells near the boundary of the proposed pits in order to adequately characterize water quality, pit inflows and outflows, and water table fluctuations." Id. at 6-7, cmt. 41. In addition, they noted that it was "important to understand the source of water to the high flow springs that contribute flow to Beaver Creek and Lodge Pole Creek" because if they "represent discharge from geologic units that will be impacted by mining operations," the streams could be impacted. Id. at 19, cmt. 112.

Although similar concerns were not raised by BLM and DSL in their fourth completeness review, EPA raised them directly with Zortman in commenting on the proposal. (MTM-77778, Vol. 14, letter of June 7, 1993; see Zortman "Responses to DSL 5/12/93 Letter" and "Responses to EPA 2/24/93 and 5/5/93 Letters" at 27, 29, 31, cmts. 4, 7-8, 11.)

In their fifth review, BLM and DSL declared the application complete by letter dated July 9, 1993. (MTM-77778, Vol. 15; EIS at 1-10.) As previously noted, by that time the Montana State Director had ordered changes in operations and required Zortman to submit significant modifications to its plans of operations to respond to ARD. The record indicates that the steps taken included installation of a number of groundwater monitoring wells. See, e.g., MTM-77778, Vol. 17, attachments to DSL letter of Sept. 30, 1993, and Vol. 23, December 1994 EA approving monitoring wells ZL-209 and ZL-210 on Lodgepole Creek drainage.

Questions about the adequacy of information about groundwater continued to arise during the preliminary review of the draft EIS. 11/ For example, MDHES commented that, considering the limitations on well data, "the statement that saturated conditions exist and the potentiometric surface follows the land surface cannot be supported," suggested that BLM "[r]emove the reference to the potentiometric surface if the data quality do not justify it[s] use," and challenged a statement that a majority of ARD was being captured because such knowledge "would require accurate potentiometric maps or a precise water balance or additional monitor[ing] wells to the north of mining disturbance." (MTM-77778, Vol. 23, Feb. 24, 1995 cmts. at 7, 9, 11.) Similarly, EPA noted that the EIS needed "a more adequate discussion of the quantitative aspect of the important ground-water flow systems." (MTM-77778, Vol. 24, letter of Mar. 1, 1995, at 2.) In particular, EPA stated:

> [T]here apparently is not an adequate understanding of the quantitative flow conditions in: the alluvial deposits in the

11/ Detailed comments by BLM and DSL during preliminary review appear to have been regarded as working documents and are not part of record.

> various drainages, the ore rocks (fractured metamorphic and syenite) and the Madison Group. More information should be presented on recharge/discharge conditions, vertical ground-water movement between geologic units, [and] ground-water velocities and storage properties. It is also recommended that more field work be done to expand the current understanding of the Madison aquifer flow system in the outcrop/subcrop areas in the lower parts of the drainages impacted by mining.

Id.; see 61 Fed. Reg. 47125 (Sept. 6, 1996).

The three groundwater studies clearly support the EIS' descriptions of geology and hydrology, but the completeness reviews demonstrate that BLM and DSL believed additional groundwater monitoring wells were necessary to study groundwater flows in order to develop a sufficient understanding to assess impacts of the proposed operation and reclamation procedures. The belief was consistent with BLM's "Solid Minerals Reclamation Handbook" which advises:

> The baseline survey should be conducted to identify the quantity and quality of all surface and subsurface waters which may be at risk from a proposed mineral operation. All aspects of an operation which may cause pollution need to be investigated, so that every phase of the operation can be designed to avoid contamination. It is better to avoid pollution rather than subsequently treat water.

BLM Manual Handbook H-3042-1, VII.A (rel. 3-275, Feb. 7, 1992) (emphasis added). Zortman also understood that additional information was needed. Its "Mine Expansion Study Plan" filed with BLM in 1990 promised:

> A discussion relating to regional geological setting and groundwater resources will be prepared based on published geological data, project field activities and data available from previous hydrological investigations. Aquifer characteristics will be described based on field testing and characterization of aquifer materials. A discussion of depth to water, hydrostratigraphic units, flow regimes and discharge and recharge groundwater flow rates will be prepared. If possible, a cross-section of the mine area presenting hydrostratigraphic units will be completed based on results from exploration drilling, monitoring wells and known hydrogeological relationships.

(MTM-77778, Vol. 6, "Mine Expansion Study Plan" (Aug. 29, 1990) at 38.)

Considerable information about the location of faults, fractures, shears, and other geologic features at the mine sites appears to have been available. The well logs from the 177 core holes used in the "Hydrologic Study of the OK and Independent Open Pits" (see Zortman POP at 1-22) apparently were the source for portraying faults shown on the study's potentiometric map. Numerous faults and shears at the Zortman Mine, as well as old

mine workings, are identified on maps accompanying the "Zortman Mine Expansion Waste Rock Cap and Pit Recontour Alternative" (January 1996) by Golder Associates, Inc. of Lakewood, Colorado. (Figs. 2 and 3.) Similarly, the location of shear zones, the Narrows Fault, and underground mine workings at the Landusky Mine are portrayed in the May 1995 August Pit study. Cross-sections of the proposed mine pits found in various documents may have been derived from extensive drilling undertaken by Zortman to define the target ore body. See, e.g., Zortman POP figs. 2.11, 2.12, 2.13, at 2-29 to 2-31. The EIS, however, presents only a general sketch of the location of geologic structures taken from a 1991 publication. (EIS at 3-8.)

Despite numerous statements that faults, fractures, shears, and other geologic features control groundwater flows at the mine sites, the EIS provides little analysis of the effect of specific structures. See EIS at 6-114 to 6-115, response 80, EIS at 6-129, response 163. As described above, the groundwater study for the August Pit identifies a relation between various springs and shear zones at the Landusky Mine. The EIS reports this information and also finds, as Appellants note, that water discharging to the north at spring L-20 from the Suprise shear zone is likely to be of poor quality and require capture and treatment. Id. at 4-50, 4-57, 4-67. In contrast, the EIS responds to claims that Big Warm Spring near the Zortman Mine reacted relatively quickly to a large snowfall by stating that it is "unlikely" mining "would impact the volume or quality of the discharge at Big Warm Spring due to the presence of significant topography between the mine and the spring" and that a major structural feature connecting the two is not "apparent from the surface topography or available structural maps." Id. at 6-103, response 26, 6-108 to 6-109 response 59; see at 3-108. While the responses may be valid, they reflect a lack of information about the geology which lies between the mine and the spring. Similarly, while BLM understands that groundwater flowing north at the Landusky Mine is likely controlled by the Narrows fault zone and the Suprise shear zone, regarding the Zortman Mine it states simply that evidence "suggests that the majority of recharge to the pit complex currently flows to the south" but that "there is some potential for degraded water within the Zortman pit backfill to flow towards the north." Id. at 6-111 to 6-112, response 68. 12/

Ultimately, BLM's and Zortman's position that there was sufficient information to assess impacts is not based upon the quantity or quality of the available information about groundwater but upon the extensive water management system designed to divert and control surface water runoff,

12/ The "Hydrologic Study of the OK and Independent Open Pits" states at page 2: "Regional ground water flow is towards the north, however, the flow in the mine area is governed by the local topography and geological structures." The "Baseline Water Resources Monitoring Plan" reports that "[o]n a regional scale, the general groundwater flow direction in this [the Madison] aquifer is from south to north (Feltis, 1983) * * *." (Zortman POP, vol. 5, App. 8, at 4-5.)

capture and treat contaminated water, and limit infiltration into reclaimed mine facilities, elements of which are either part of Zortman's proposed mining operation or mandated by the stipulations BLM has imposed. (BLM Answer at 33-34; ZMI Answer at 41-43.) As stated in the ROD, "ARD discharges to groundwater are minimized by diverting runon waters, limiting infiltrating waters, and preventing the release of untreated water to surface drainages that may recharge the groundwater systems." (ROD at 34.) In effect, they contend that the water management plan and other features minimize the potential for groundwater contamination and support the EIS' findings that groundwater contamination, particularly in the northern drainages, is not likely to occur.

Although Appellants criticize several features of the water management system (see, e.g., NWF SOR at 65-66), their broader argument is that the lack of information about groundwater undermines BLM's ability to identify and evaluate potential impacts on groundwater as required by NEPA. Among other matters, they criticize the EIS' potentiometric surface maps which portray the location of a groundwater divide at each mine and underlie BLM's conclusion that northern drainages are unlikely to be affected. The maps were added to the final EIS and are labeled as based upon "data collected May 1995." (EIS figs. 3.2-9 and 3.2-10, at 3-50 and 3-52; cf. Draft EIS at 3-45 to 3-46.) 13/

The origin of the maps and the data they are drawn from is not apparent from either the EIS or the record. The August Pit study is dated May 1995, but its data was obtained in March 1995. It reports bedrock groundwater elevations between 4,625 and 4,634 feet, while the EIS shows a groundwater divide above 4,650 feet. Although only slightly different water elevations are reported for most wells, the EIS shows well 95LH-11 to have a groundwater elevation of 4,673 feet, while the August Pit study reports an elevation of 4,773 feet in a perched water table. It is possible that separate readings were taken in May, but it is unclear why data for 1 month was relied upon instead of the 6-month minimum identified in the third completeness review as necessary to establish baseline conditions. The potentiometric surface map for the Zortman mine identifies more wells than the four near the mine pit used for the "Baseline Water Resources Monitoring Plan" and the "Hydrologic Study of the OK and Independent Open Pits" and its contours and groundwater divide do not clearly correspond to those in either study. The data for most wells appears to be the same as on the potentiometric surface map in the "Evaluation of

13/ In addition, line drawings showing "typical" north-south and east-west cross-sections of the mines, identified as having been prepared by Zortman in September 1994, were modified in the final EIS by adding two lines to show an estimated potentiometric surface during dewatering of the expanded pits and an estimated potentiometric surface in May 1995. Compare draft EIS at 2-120, 2-121 with EIS at 2-112, 2-113 (Zortman) and draft EIS at 2-164, 2-165 with EIS at 2-115, 2-116 (Landusky).

Groundwater Resources," but it identifies the elevation of well ZL-210 as 4,768 feet, rather than 4,663, which has the effect of flattening and broadening the upper potentiometric surface, and there are distinct differences in the shapes and positions of the contours. Differences in contours are also found in comparing the EIS' map for the Landusky Mine with exhibit 4 of the "Evaluation of Groundwater Resources." As discussed above, there is no clear indication in the record that the "Evaluation of Groundwater Resources" was relied upon in preparing the final EIS.

A reliable understanding of the potentiometric surface and groundwater divide is important because the EIS evaluates both the quantity of water which will flow to various drainages and the fate of groundwater if it becomes contaminated. BLM may be correct that the potentiometric surface generally reflects the surface topography, but Zortman's operations have changed the landscape at the mine sites. The EIS notes that operations at the Zortman Mine have reduced the elevation of two hills by 200 feet or more and one hill at the Landusky Mine has been lowered by 500 feet and another high point has been reduced 300 feet. (EIS at 4-5.) The reclaimed area will be juxtaposed against undisturbed geologic formations. Undoubtedly, drainage controls and reclamation covers will limit the amount of surface water entering reclaimed mine pits and waste dumps, as well as total groundwater recharge, and in that sense mitigate impacts. A limited understanding of the potentiometric surface and the effect of specific geologic features, however, precluded BLM from evaluating the extent to which groundwater will migrate to and through reclaimed areas, become contaminated by contact with sulfide material remaining in buried pit walls, backfill, and waste dumps, and enter surface waters or aquifers. Except for limited information drawn from the August Pit study, the EIS fails to analyze the direction and quantity of groundwater moving through various portions of the mine sites and the effect specific faults, fractures, and shears will have in directing groundwater to an aquifer or a point at which it will emerge as surface water.

Zortman and BLM also rely upon surface monitoring sites and monitoring wells to detect contaminated groundwater for capture and treatment. In particular, they point to the large number of monitoring wells and sites which have been established, the requirement of Stipulation 54 of the ROD that Zortman must install additional monitoring wells, including north of the mine pits, and the CD's requirement that, if contaminated groundwater is detected, Zortman must propose and implement corrective action, including capture and treatment. (ZMI Answer at 31-32, 42-44; BLM Answer at 34-35; see EIS at 2-235 to 2-236; ROD at 17-18; CD, App. C, para. VII.15.d.) The ROD describes the additional wells and sites as "necessary to evaluate water quality impacts and to provide information that will assist in directing remediation should it become necessary." (ROD at 19).

The chief limitation on reliance on monitoring was noted in the June 16, 1997, Stay Order: "Whether monitoring wells will reliably detect contamination and, should it occur, effectively capture it for treatment depends upon the location of the wells at geologically appropriate sites."

(Order of June 16, 1997, at 14.) Although requiring additional monitoring wells may be proper mitigation for anticipated impacts, it does not substitute for information needed to assess impacts. The information the wells provide can assist in understanding the geohydrology of the mine sites only after they have been drilled and the data obtained is analyzed. The record shows that monitoring wells have consistently been added over the years, but the groundwater studies on which the EIS is predicated rely on data from relatively few of them. A limited understanding of the geologic features controlling the flow of groundwater limited BLM's ability to determine where contaminated groundwater might be intercepted or would emerge for capture and treatment. The need for reliable monitoring is acute because, after reclamation, water monitoring and capture and treatment is to continue for 20 years in the short term and longer term capture and treatment may be needed. (EIS at ES-23 to ES-27, 4-73.)

Likewise, the fact BLM has required Zortman to operate in accordance with Appendix A of the EIS and Appendix A of the CD cannot substitute for an understanding of groundwater flows at the mine sites and an analysis of potential impacts. See ROD at 11; ZMI Answer at 42-43; BLM Answer at 34-35. The EIS was issued in March 1996 before the CD became final in September and before completion of the July 1996 "Water Quality Improvement and Monitoring Compliance Plan." There is no reason to doubt that BLM was familiar with matters being negotiated and received drafts of the plan. Appendix A of the EIS appears to have been drafted to incorporate portions of the plan. 14/ It identifies the location of surface water diversion ditches and capture structures and describes measures to be taken to meet water quality standards. The controls may limit impacts, but are not an analysis of them.

14/ The record provides conflicting statements about Appendix A of the CD and its relation to Appendix A of the EIS. The ROD states at page 12 that "[w]hile the Consent Decree addresses water management needs for the existing mining operations, it does not cover those that may be needed for expanded mining" but that "[d]esigns for water management at new or expanded mine facilities * * * are contained in Appendix A of the EIS * * *." At page 41, however, the ROD states that Alternative 7 "includes measures necessary to address causes of past alleged violations of the Montana Water Quality Act and the Federal Clean Water Act" and requires Zortman "to obtain the necessary N/MPDES permits. These plans are presented in Appendix A of the Final EIS and in the Compliance Plan under the Consent Decree entered on September 27, 1996." See EIS at 6-41 response 1 (Appendix A describes "the water quality improvement measures proposed by ZMI as part of the settlement agreement" and "measures that would be used * * * to achieve compliance); at 6-46 response 20 and at 6-49 response 38 ("Appendix A presents the Water Quality Improvement Plan which has been derived from water quality improvement measures proposed by ZMI" and "outlines the technical approaches to a plan to improve water quality and is mitigation").

[3] Accordingly, we find that there was "incomplete or unavailable information" to evaluate reasonably foreseeable significant adverse effects on the human environment, in particular, impacts on groundwater during the proposed expanded operations and after the mine sites are reclaimed. The EIS' disclosures that information about groundwater was limited were not sufficient to comply with 40 C.F.R. § 1502.22. BLM was obligated to obtain additional information or, if the means to obtain it were not known, address the matters set forth at 40 C.F.R. § 1502.22(b). Although the water management system may limit infiltration and reduce the probability of groundwater contamination, a low probability does not exclude groundwater contamination as a "reasonably foreseeable significant adverse impact." 40 C.F.R. § 1502.22(b). The fact groundwater has been an issue for many years and the attention it receives in the EIS attest to the fact that impacts may be significant and additional information was "essential to a reasoned choice among alternatives." The fundamental point of NEPA's action-forcing procedures is to require Federal agencies to take a "hard look" at environmental consequences. Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 349-50 (1989); Kleppe v. Sierra Club, 427 U.S. 390, 410 n.21 (1976); see also 40 C.F.R. § 1500.1. Absent compliance with the regulation, we cannot say that BLM took a hard look at the environmental consequences of long-term reclamation.

Although we agree with the Appellants that BLM had a responsibility to obtain additional information, we do not agree that it was required to await completion of the groundwater study called for by the CD or that it must now await any other study which may be underway. As noted in the June 16, 1997, Stay Order, the law recognizes that the acquisition of knowledge is a continuing process and NEPA does not require an agency to have complete information to analyze environmental impacts. See, e.g., Bryant Eagle Timber Sale, 133 IBLA 25, 29 (1995). As we have analyzed, the fundamental error in this case was BLM's failure to act on its early recognition that additional information about groundwater was needed to adequately assess reasonably foreseeable significant adverse impacts and to either obtain the information or provide the analysis described in 40 C.F.R. § 1502.22(b). The study required by the CD, as well as the "Evaluation of Groundwater Resources," may provide valuable insight into groundwater flows at the mine sites. The problem, however, is not that BLM lacked the analysis which the studies might provide, but that it lacked information about groundwater flows needed to make its own analysis of possible impacts. Had BLM obtained sufficient information and conducted an analysis of reasonably foreseeable significant adverse impacts, no purpose would have been served in waiting for the additional study. 15/

15/ It appears that the study required by the CD has been completed and will be available to BLM. See note 10, supra. BLM has "a continuing duty to gather and evaluate new information relevant to the environmental impact of its actions, even after release of an EIS." Stop H-3 Association v. Dole, 740 F.2d 1442, 1463 (9th Cir. 1984), citing Warm Springs Dam Task Force v. Gribble, 621 F.2d 1019, 1023-24 (9th Cir. 1980); see Animal

Unnecessary or Undue Degradation

[4] The surface management regulations, promulgated pursuant to 43 U.S.C. § 1732(b) (1994), define "unnecessary or undue degradation" to mean:

> surface disturbance greater than what would normally result when an activity is being accomplished by a prudent operator in usual, customary, and proficient operations of similar character and taking into consideration the effects of operations on other resources and land uses, including those resources and uses outside the area of operations. * * * Failure to comply with applicable environmental protection statutes and regulations thereunder will constitute unnecessary or undue degradation.

43 C.F.R. § 3809.0-5(k) (emphasis added), see § 3809.2-2; Charles S. Stoll, 137 IBLA 116, 125 (1996); Arthur Farthing, 136 IBLA 70, 73 (1996). Like NEPA, the definition requires BLM to consider the nature and extent of surface disturbances resulting from a proposed operation and environmental impacts on resources and lands outside the area of operations. Kendall's Concerned Area Residents, 129 IBLA 130, 140-41 (1994); Nez Perce Tribal Executive Committee, 120 IBLA 34, 36 (1991); see Sierra Club v. Hodel, 848 F.2d 1068, 1078, 1091 (10th Cir. 1988) (nondegradation duty is mandatory). Lands held in trust for the benefit of Indians, however, are not "public lands" under the statute. 43 U.S.C. § 1702(e) (1994); see F. Cohen, Handbook of Federal Indian Law, at 209 n.19 (1982 ed.). Consequently, many of the matters Appellants identify as off-site impacts are not germane. See NWF Reply at 31. Nevertheless, most disturbed land at the mine sites is public land and other public land is adjacent to them. (EIS at 1-9.) To the extent BLM failed to meet its obligations under NEPA, it also failed to protect public lands from unnecessary or undue degradation.

Conclusion

Appellants have raised issues challenging the adequacy of the EIS and the reclamation measures BLM has approved. Zortman's announcement that

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fn. 15 (continued)
Defense Council v. Hodel, 840 F.2d 1432, 1438 (9th Cir. 1988). After receiving Zortman's final reclamation plans, BLM must decide whether to prepare a supplemental EIS because there have been "substantial changes in the proposed action that are relevant to environmental concerns; or * * * significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts." 40 C.F.R. § 1502.9(c); see Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 374 (1989); Louisiana Wildlife Federation v. York, 761 F.2d 1044, 1050-51 (5th Cir. 1985), quoting Wisconsin v. Weinberger, 745 F.2d 412, 418, 420-21 (7th Cir. 1984).

it will not expand the mines does not preclude addressing those issues. Review of the record leads to the conclusion that BLM did not fully observe its trust responsibility to the Tribes, had incomplete information about groundwater flows which was essential to a reasoned choice among alternatives and did not comply with 40 C.F.R. § 1502.22, and failed to protect public lands from unnecessary or undue degradation.

Accordingly, pursuant to the authority delegated to the Interior Board of Land Appeals by the Secretary of the Interior, 43 C.F.R. § 4.1, the appeals are dismissed in part as moot and the October 25, 1996, Decisions of the Phillips Resource Area, Area Manager are vacated in part and remanded.

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Will A. Irwin
Administrative Judge

I concur in the result:

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Franklin D. Arness
Administrative Judge